GARDEN AND FOREST.

PUBLISHED WEEKLY BY

THE GARDEN AND FOREST PUBLISHING CO.

OFFICE: TRIBUNE BUILDING, NEW YORK.

Conducted by . . . . . Professor C. S. SARGENT.

ENTERED AS SECOND-CLASS MATTER AT THE POST-OFFICE AT NEW YORK, N. Y.

NEW YORK, WEDNESDAY, DECEMBER 29, 1897.

TABLE OF CONTENTS.

PAGE.

EDITORIAL ARTICLE:—American Trees for America 509
Notes on Cultivated Conifers.—XIII. . . . . C. S. S. 509
The Botanic Garden of Smith College. (With map.) . . William F. Ganong. 512
PLANT NOTES:—The Fruit of Sequoia. (With figure.) . . . . . C. S. S. 514
Notes on the Botany of some Southern Swamps . . . . . B. F. Bush. 514
THE FOREST:—The Shasta Fir (Abies Shastensis) . . . . . C. V. Coville. 516
RECENT PUBLICATIONS 517
NOTES 518
ILLUSTRATIONS:—Map of the Botanic Garden of Smith College 513
Sequoia Wellingtonia, Fig. 66 515

American Trees for America.

LOOKING at the matter broadly, comparatively little, in northern countries at least, has been accomplished toward beautifying the earth's surface by transferring trees from one region to another, although a great deal of time, energy and money has been expended during the last two hundred years in the attempt to do it. It has given to Europe from America the Locust, the great southern Magnolia, the Negundo, the White Pine, several California conifers, the Arbor Vitæ, one or two Thorns, and the Staghorn Sumach, as truly permanent and valuable additions to the native silva; China has really enriched Europe, as it has eastern North America, with the Ginkgo, the Ailanthus, the Paulownia, the Yulan Magnolias, the Weeping Willow and the flowering Apples; western Asia has sent to Europe the Cedar of Lebanon, the Oriental Plane, the Oriental Spruce and the Cypress, while experiment has shown that of the trees of Europe and western Asia only the White Willows, the Beech, the Elm, the Norway Maple, the Oriental Plane, the Larch, the Box, the Hawthorn and the Mountain Ash can really be depended on in the eastern states to live out their lives in health and beauty. These results may appear small to economists, but certainly all the effort that has been expended in testing exotic trees in Europe and America has been well repaid in the stimulus it has given to the study of botany, in the increase of knowledge and in its few really important practical results. Still, the lesson to be drawn from these two centuries of effort is clearly that the best trees to plant in any particular region are those that grow and thrive naturally in that region. No teacher in such matters is so wise, experienced and unprejudiced as Nature herself, and when her teachings have been followed the best results from tree-planting have always been obtained. The Elms and Maples taken from adjacent swamps and hillsides, which grace the streets of many New England country towns and adorn many New England homesteads, and the Magnolias, Live Oaks and Water Oaks in the streets and gardens of the south testify to the value of native trees; and in England, too, it is the native Oaks, Elms and Beeches which give its distinctive aspect to the land and make its parks the most dignified in the world. Fortunately, in this country it is not difficult to apply this rule, for no other land is blessed with such a rich, varied and splendid silva. In the southern United States the great evergreen Magnolia, the most beautiful of the broad-leaved evergreen trees of the northern hemisphere, the Live Oak, the Water Oak, the Laurel Oak, the Pecan and noble Bay trees, are available for the planter. In the Pacific coast states the conditions are somewhat different; the number of native trees is smaller than it is in the east, and many of the finest of these are found naturally only at high elevations and cannot be successfully cultivated in the warm, dry valleys in which the people of these states have principally established their homes. Some of the trees which grow in the valleys spontaneously are not ornamental, and are often difficult to cultivate, but some of the noble California Valley Oaks surpass in stately beauty any exotic trees which are likely to flourish in that peculiar climate, and two California conifers, the Monterey Cypress and the Monterey Pine, are generally and successfully grown from Vancouver Island to San Diego. These are both beautiful trees, but California will doubtless always be obliged to depend on other parts of the world for many of her ornamental plants. The trees of the eastern states do not flourish west of the Rocky Mountains; it is not probable that those of Europe or Asia will ever gain much foothold in the soil of California, and it is to Australia, Mexico and other dry countries that California planters will continue probably to derive much of the material needed for the decoration of their parks and gardens.

It is in the eastern and middle states, however, where there is a greater interest in ornamental planting than in other parts of the country, that most is to be obtained from the native silva. That of no other part of the world is richer in handsome trees. From its Magnolias, Oaks, Hickories, Walnuts, Elms and Ashes, its Tupelo and stately Tulip-tree, its Rhododendrons and Mountain Laurels, its Birches and Lindens, its Coffee-tree and Honey Locust, its Sourwood and Sassafras, its Beech, Chestnut, Yellow-wood and Wild Cherry, its Catalpas, its Persimmon and Silverbell tree, its Flowering Dogwood and Fringe-tree, its Liquidambar and Hackberry, its Sumachs, its Wild Crab and its Hawthorns, planters of deciduous-leaved trees can choose material enough to satisfy every taste and fill every requirement. And among coniferous trees none is more picturesque in youth or more stately at maturity than the northern White Pine, more graceful than the Hemlock, or more symmetrical and enduring than the Red Cedar.

In the past our gardens have suffered from the general ignorance with regard to the true beauty and value of native trees, which appears to have been peculiar to us as a nation. Too often the planter, unable to obtain American trees, has had to rely on the Spruces, Oaks, Ashes, Maples, Pines and other trees of Europe, and these are still too largely used in this country, although it is now known that they are entirely unsuited to our climate and that where they have been used in public parks they must soon be replaced by native species. The lesson has been a costly one, but the experience has not been dearly purchased if we have finally come to realize that Nature has placed for us in America a greater number of beautiful trees, large and small, than is found in any other part of the world, and that American trees are the best for America.

Notes on Cultivated Conifers.—XIII.

ABIES, the name now given to the Silver Firs, is one of the widely distributed coniferous genera with a larger number of species than any other except Pinus. It is well characterized by its flat or more or less quadrangular leaves, without persistent woody bases, spreading on lateral branches in two ranks and leaving in falling nearly circular scars, scattered axillary male flowers, erect cones usually produced only on the upper branches and maturing in one season, their thin entire, rounded scales being often shorter than the bracts, and separating at maturity from the

central axis of the cone. Abies, which is usually found on the slopes of high mountains, is represented in North America by ten species, seven of them belonging to the flora of the Pacific states and one to Mexico; it is common in Japan with several species, and is widely scattered over Siberia, the Himalayas, Asia Minor, central and southern Europe and northern Africa. The Silver Firs are pyramidal trees with small branches arranged in regular whorls and usually thin bark filled with large conspicuous resin vesicles; some of the species grow to a very large size, especially those of western America, and others are valuable timber-trees. No genus of conifers probably has contributed more to the beauty of gardens, for nearly all Fir-trees are extremely handsome while young. Their tendency, however, to become thin and lose their lower branches early when they are taken from cool mountain slopes makes the first thirty or forty years of the lives of these trees the most attractive period of their garden career.

The species which grows in the swamps and on the mountains of the north-eastern part of this continent from Labrador and the shores of Hudson's Bay southward to the high mountain peaks of Virginia, the so-called Balsam or Balsam Fir (Abies balsamea), is a beautiful tree while it is small, with lustrous foliage and dark purple cones. Its beauty, however, is short-lived in cultivation, and the tall, narrow, scrawny Balsams still so common in the neighborhood of New England farmhouses show how worthless it is for any scheme of permanent decoration. The dwarf spreading Silver Fir, only a foot or two high, frequently cultivated under the name of Abies Hudsonica, although it has not produced cones and nothing is known of its origin, is probably a depauperate form of Abies balsamea. Beissner describes a number of other seminal varieties of this tree which are grown in Europe, but I have never seen any of them. A seedling form sent several years ago to the Arnold Arboretum by Robert Douglas is distinct in its broader and more crowded leaves.

The second eastern American Silver Fir, Abies Fraseri, a small tree found only on the highest slopes of the southern Appalachian Mountains, will probably not be of more permanent value here as an ornamental tree than the northern Balsam, from which it chiefly differs in the long exserted recurved bracts of the cone-scales. The southern tree appears to have been common in European collections about the beginning of the century, and then probably entirely disappeared from gardens, as for many years seeds of Abies balsamea were sold for those of Abies Fraseri, and most of the plants now cultivated under that name are certainly wrongly named. For nearly twenty years, however, Abies Fraseri has been growing in the Arnold Arboretum, where it is perfectly hardy, produces cones and is still good-looking.

Of the Silver Firs of western America the most valuable here as a garden plant is Abies concolor, the White Fir of the southern Rocky Mountains, of the California Sierras, of the Pacific coast ranges, of many of the interior mountains of the south-western states and of northern Mexico. No other Abies flourishes in such hot, dry regions or has been able to sustain itself among such climatic hardships; and it is not surprising that a tree, which is equally at home in the sea-fogs which sweep in from the Pacific over the California coast ranges as it is on the mountains of Lower California, southern Arizona and central Colorado, should find little to fear from the cold blasts and hot summers of New England. Both the California form, with its rather shorter and greener leaves, which in England is still called Abies Lowiana, and in this country sometimes Abies Parsonsii, and the handsomer Colorado form with longer blue leaves, are perfectly hardy in New England. The oldest specimens here of the California tree are already becoming somewhat thin and are beginning to lose their lower branches, and so have passed the period of greatest beauty. The largest of the Colorado plants, however, in eastern gardens, which are now probably twenty-five feet in height, are still perfect in habit and density of foliage, surpassing in vigor and in loveliness of form and color all the Abies hardy in New England, and are still as full of promise as trees of the same age in sheltered ravines of the Rocky Mountains. However ugly and unsatisfactory old trees of this Fir may become here later, it deserves a place in every garden for the beauty of its early years.

None of the other western American Abies promise to be of much value to us here in the east. Abies lasiocarpa (A. subalpina of Engelmann), which is the most widely distributed of the North American species, ranging as it does from Alaska southward over all the high interior mountain systems to northern Arizona, has been cultivated for many years in the Arboretum, where it is perfectly hardy, but grows very slowly, forming here broad compact pyramids of pale blue-green foliage. A tree of the north and of high mountains, where it grows up to the timber-line, Abies lasiocarpa will probably never attain at the sea-level a large size or show the narrow spire-like pointed head of dense foliage which makes this tree such a beautiful object in the alpine forests of the west and the not unworthy associate of the lovely Patton's Spruce. Among the seedlings raised at the Arnold Arboretum is a plant of this Abies which has remained a low flat cushion only a few inches in height, which now promises to be one of the most attractive of the dwarf hardy conifers.

Abies amabilis, Abies nobilis, Abies magnifica and Abies grandis, the four largest Fir-trees in the world, can be kept alive here in sheltered positions, although none of them will probably ever be of any permanent value in our plantations. Of these four trees Abies nobilis of the mountains of Oregon and Washington is, perhaps, the hardiest, and fairly healthy specimens can occasionally be found in eastern gardens. Abies amabilis, which has always grown badly in cultivation, even in Europe, is a more northern tree. It grows, however, very slowly in the eastern states, and gives little promise of ever becoming large enough to show its true character and beauty. The other American species, Abies venusta of the Santa Lucia Mountains of California, the least widely distributed of all the Abies, and Abies religiosa of Mexico, are too tender for New England and the middle states, so that of the ten American species only Abies concolor is really valuable in eastern gardens where, moreover, it will possibly be beautiful only during the years of its early vigor.

In Japan there are probably only five species of Abies, although a number of others have been described at different times. These trees are all hardy in New England, where they grow with varied success. The largest and most beautiful of the Japanese Firs is Abies firma, which I have seen in Japan only in cultivation, when it often attains a height of 120 feet and produces a tall straight stem from four to six feet in diameter. As it grows in temple gardens near Tōkyō, where the climate is not very unlike that of Charleston, South Carolina, it is the handsomest of all Firs, distinguished by nobility of port and bright green and very lustrous long rigid leaves which are sometimes sharply pointed and sometimes notched at the apex. This beautiful tree has generally proved a disappointment in the United States and Europe. It is very hardy even in eastern Massachusetts, where it grows rapidly and where in the Arboretum it has produced cones. In this country, however, it is almost always ragged and miserable in appearance, and it evidently needs a warmer and moister climate than that of the northern states to develop its beauties.

Abies homolepis, which is usually cultivated in our gardens under the name of Abies brachyphylla, is the common Fir of central Japan, where it abounds at elevations between 4,000 and 5,000 feet above the sea, and where it is scattered singly or in small groups through the Birch and Oak woods which exist just below the subalpine Hemlock forest belt. It is a massive, although not a tall, tree, and in old age is easily distinguished from all other Firs by its broad round head, the branches near the tops of the trees growing more vigorously and to a greater length than those lower on the

stems. This peculiarity is seen even in the young plants in our gardens, on which the short lower branches are usually soon shaded by those above them. The pale bark, long crowded leaves, dark green on one surface and silvery white on the other, and the large purple cones make this a beautiful tree. It grows here very rapidly and is perfectly hardy, but probably will be early disfigured by the loss of the branches near the base of the trunk. Abies Veitchii forms forests of considerable extent on the high slopes of Fugi-san and is another handsome tree with lustrous dark green leaves, silvery white below. From Abies homolepis, to which it bears considerable resemblance, it may be distinguished by its shorter and more crowded leaves, by its more slender branches coated with fine pubescence, and smaller cones. This tree was sent to the Parsons Nursery in Flushing nearly forty years ago by Mr. Thomas Hogg, and was cultivated in the United States under the unpublished name of Abies Japonica for many years before it was introduced into Europe. It is very hardy in eastern Massachusetts, where it has produced cones, and in its young state, at least, is an exceedingly beautiful tree of slender pyramidal habit and dense lustrous foliage.

Abies Mariesii, which appears to grow only on a few of the high mountains of northern Hondo and at one point on the southern coast of Yezo, is a compact, shapely pyramidal tree forty to fifty feet in height, with crowded branches covered with short, dark foliage, pale below and abundant large dark purple cones. In this country and Europe, although it appears to be hardy enough, Abies Mariesii is a feeble grower and gives little promise of success.

The Silver Fir of Yezo (Abies Sachalinensis) is a tall pyramidal tree with pale bark, long slender dark green leaves and conspicuous white buds which make it easy to distinguish this species at any time. It is not rare on the hills of central Yezo, and in the northern part of that island and in Saghalin it is said to form great forests. In the neighborhood of Boston, where it is very hardy, Abies Sachalinensis grows more rapidly than any of the other Abies. The largest plants are, however, only five or six feet high and too young, of course, to give any idea of the permanent value here of this tree.

In China Abies is less common than it is in Japan, although a still little-known species has been found by Dr. Augustine Henry on the mountains of Hupeh, in the central part of the empire. Further north the Silver Fir of Siberia (Abies Sibirica) ranges eastward to the valley of the Amoor River and to Kamtschatka. This is a very hardy tree in New England, of slender pyramidal habit and narrow dark green lustrous leaves, in form and color not unlike Abies Sachalinensis. I do not know that it has produced cones here yet, although the largest trees are from twenty-five to thirty feet in height and have already passed the period of their greatest beauty. This is one of the earliest of the Silver Firs to begin its growth in the spring, and in western Europe it is often injured every year by spring frosts. The Himalayan Fir (Abies Webbiana), which sometimes grows to the height of 150 feet, with a trunk ten feet in diameter, and is distributed from Bootan to Afghanistan at elevations between seven and thirteen thousand feet above the sea, is one of the handsomest of the whole genus, with leaves which are dark green and lustrous on one side and silvery white on the other, and large bright purple cones. This tree grows only moderately well even in sheltered positions in western Europe, where it frequently suffers from late spring frosts, but in some of the gardens of southern France and northern Italy it appears to be perfectly at home. I have never seen a specimen in this country, and the Himalayan Fir would certainly not be hardy in the north-Atlantic states. In south-western Asia and south-eastern Europe there is an interesting group of Abies. The most widely distributed and best known of these trees is the common Silver Fir of Europe (Abies pectinata), which is distributed from central France to middle Russia, and grows also on the mountains of Macedonia and Greece and on some of those of the eastern provinces of Asia Minor. This is the Silver Fir of the silviculturists of central Europe, who consider it a valuable timber-tree, although the wood which it produces is inferior to that of the Spruce. Long a popular ornamental tree in England, Abies pectinata was probably first brought to this country nearly a century ago. It has never proved very successful here, although occasionally a healthy specimen fifty feet high or more can be found in some old garden of the middle states. In New England, except in very sheltered positions, it suffers from the cold and usually disappears at the end of a few years. Among several abnormal forms of this species the most distinct is the variety pendula, a handsome tree with distinctly pendulous branches; variety nana, a handsome bush, which in time often loses its dwarf habit and grows into the normal form, and the variety columnaris with erect branches pressed closely against the stem and short crowded leaves.

Another of this group, Abies Cephalonica, is a distinct-looking tree with branches long in proportion to the height of the stem and crowded rigid sharp-pointed leaves. It is a native of Mount Enos, on the island of Cephalonia, and has been an inhabitant of English gardens since 1824. The Cephalonian Fir is quite hardy in eastern Massachusetts, and there are specimens in Mr. Hunnewell's pinetum which are from thirty to forty feet in height and have produced cones for several years. Large plants in this country, however, are not handsome, and the Cephalonian Fir is probably one of the least desirable of the genus as an ornament of our gardens. Abies Apollinis and Abies Reginæ-Amaliæ, natives of the mountains of Greece, are usually considered merely geographical forms of Abies Cephalonica; they are both hardy here in a young state and the largest plants which I have seen in this country, still only a few feet high, are handsome. Abies Nordmanniana, another of the Silver Firs of south-western Asia, has been the most generally planted of all the Old World Abies in the northern states, where it has proved very hardy and one of the most beautiful and satisfactory of the exotic conifers which have been tried here. The largest plants in the eastern states are now from fifty to sixty feet in height and are still well furnished with branches clothed with beautiful crowded leaves dark green and lustrous above and silvery white below. The Nordmann Fir is a native of the mountain forests east and south-east of the Black Sea, including the western spurs of the Caucasus, and in its native country it is said to grow to the height of 150 feet, with a trunk five or six feet in diameter, in forests of Oaks, Hornbeams and other deciduous-leaved trees. A number of seminal varieties which I have not seen are cultivated and described by European nurserymen.

A more beautiful tree, perhaps, at least in its young state, than the Nordmann Fir, although still much less well known in American gardens, is the Cilician Fir (Abies Cilicica), a more southern species confined chiefly to high elevations on the Taurus and anti-Taurus, where it is the companion of the Cedar of Lebanon, and to the Lebanon range itself. Rarely seen in western Europe, where it suffers seriously from spring frosts, the Cilician Fir grows admirably in New England, where it forms splendid broad-based, dense pyramids covered with lustrous narrow leaves conspicuously marked with pale stomata. This is a difficult tree to obtain; it has not been long enough in this country to produce seeds here; apparently they never ripen in western Europe, and it seems impossible to obtain them from the remote and inaccessible forests which are the home of this tree.

The handsome Algerian Silver Fir (Abies Numidica), which grows well in England and some parts of France, is probably nowhere hardy in the northern states; and the beautiful Spanish and north African Abies Pinsapo, which is one of the handsomest conifers cultivated in central and western Europe, where it has already grown to a good size, can only be kept alive here in sheltered situations, and will never show its real beauty in the northern states.

This brief review of the species of Taxids and Conifers which have been tried in our gardens, or which are likely

to succeed here, shows that the number of species of these great families which can be really depended on to grow permanently in this part of the world is a small one. Pinus Strobus, Pinus resinosa, Pinus rigida, Picea alba, Picea rubra, Juniperus Virginiana, Juniperus communis, Thuya occidentalis, Tsuga Canadensis, Ginkgo biloba, Larix Americana and Larix Europea are the only handsome trees of these families which have shown themselves able to grow in this climate to a large size and preserve in cultivation here their mature beauty. All of these, with the exception of the Ginkgo and the European Larch, belong to our northern silva. In a second list may be placed Abies concolor, Pseudotsuga taxifolia and Picea Engelmanni of the Rocky Mountains, Taxus cuspidata, Abies homolepis, Abies Veitchii, Picea Ajanensis, Pinus parviflora, Thuya Standishii and Sciadopitys verticillata of Japan, Pinus Koraiensis of Corea, Pseudolarix Kæmpferi and Pinus Bungeana of northern China, Abies Nordmanniana, Abies Cilicica and Picea orientalis of Anatolia. The trees in this second list all do well in the northern states, where they have been grown from twenty-five to fifty years, although none of them have been tried long enough yet to show their ability to thrive permanently here. In a third list of species promising in this climate, but still less tried than those of the second list, may be placed Abies Sachalinensis, Pinus densiflora, Abies lasiocarpa, the two Japanese Hemlocks, Thuya plicata, Tsuga Caroliniana, Tsuga Pattoni, Picea Omorika, Larix Dahurica and Tumion nuciferum. If these all succeed here the number of plants of these families which we can really depend on is still very small, and the permanent decoration of the parks and gardens of the north-eastern states will have to be largely made of broad-leaved trees, which flourish here almost as well as in any other part of the world, and of a comparatively small number of species of Taxids and Conifers.

C. S. S.

The Botanic Garden of Smith College.

A STUDY OF AN EDUCATIONAL ADAPTATION.

IT is plain to all who read the signs of the times that the present trend of botanical activity is toward the study of the phenomena of the life of plants. The facts of plant-structure, and of plant-relationships as suggested by resemblances of structure, have been relatively so well studied that for the present and near future the most attractive problems must lie in the investigation of the causes of structure. The plant static needs to be, and is being, explained by the study of the plant dynamic. But as investigation leads, so must education follow. For the systematic pursuit of physiology and ecology, however, a botanic garden with a well-proportioned greenhouse system is essential; and it is rapidly coming to pass that a college must provide these if it is ambitious to keep abreast of the general advance.

It is in this spirit that Smith College has established its Botanic Garden. As an attempt to realize with fair rapidity and minimum expense, a preformed plan which should express the optimum of adaptation to the present demands and indicated tendencies of botanical education, this venture is, perhaps, without exact precedent, and its results must possess, botanically and educationally, a far more than sectional interest.

The history of this Garden is very brief. In 1891 the trustees of the college, following the recommendation of President Seelye, to whose initiative and constant interest the Garden owes everything, decided to attempt to combine the beautifying of the college grounds with the formation of a scientifically planned botanic garden which should serve as an adjunct to the department of botany. Messrs. Olmsted, Olmsted & Eliot were engaged to draw up the plans, and in 1892 planting was begun. The next year a small greenhouse was built. In 1894 the position of Director of the Botanic Garden and Professor of Botany was established and an appointment made. Since then, though with large changes in the original plans made necessary for practical reasons, development has gone steadily on. Some progress has been made in the school of trees and shrubs; the herbaceous garden is nearing completion; the greenhouses are finished and stocked; the work of administration is systematized.

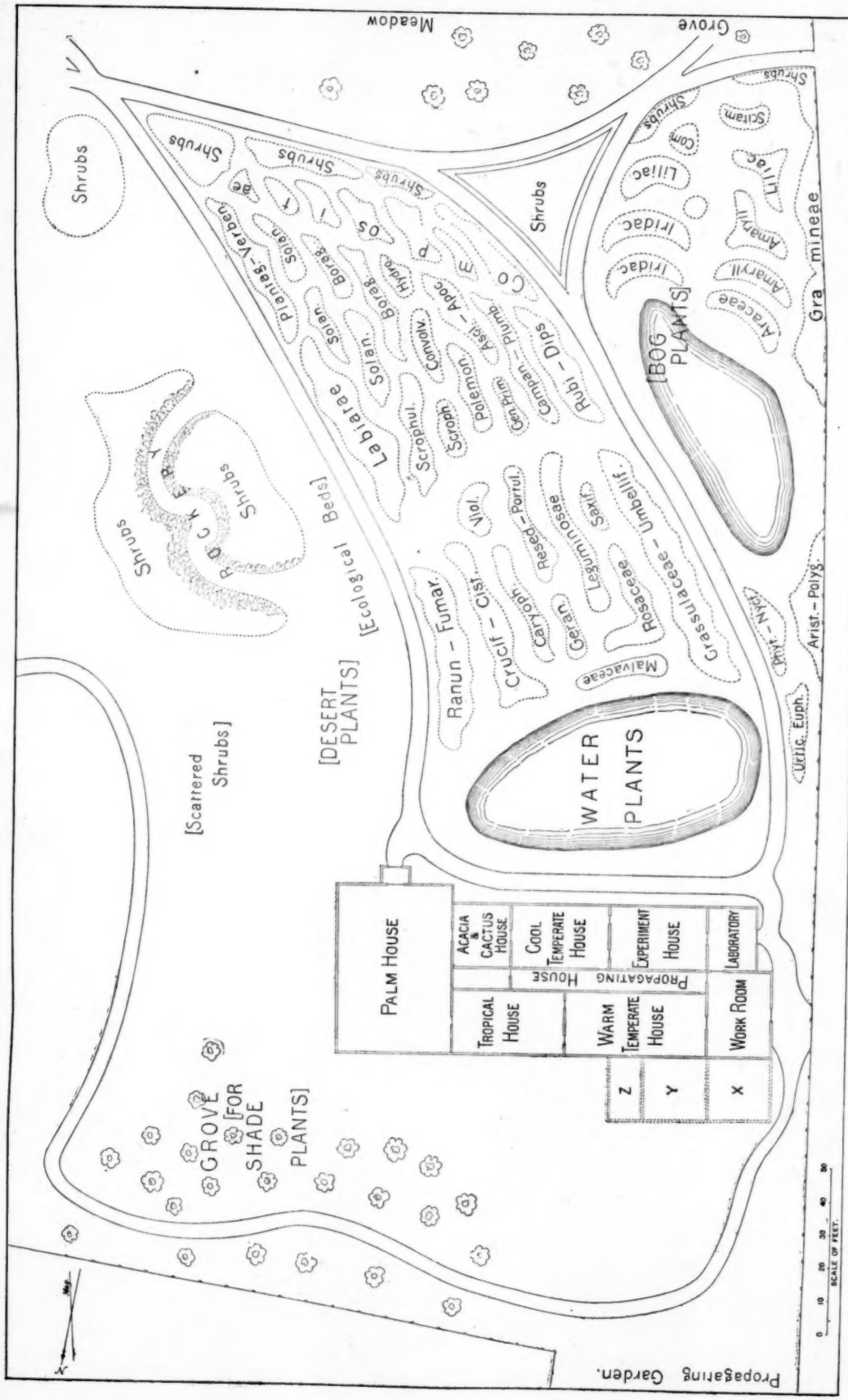
The college campus contains about thirty acres, including the space occupied by the nineteen buildings (see map on p. 513). It is roughly quadrangular in shape, and, as to surface, consists of two nearly equal plains differing fifteen to twenty feet in elevation, the higher on the north-east, with a slope of varying steepness between. The soil is mostly poor. There were originally some fine trees on the grounds, and two or three good vistas and open spaces, and from several points there are beautiful views of the distant hills or over a little lake and the woods beyond. Happily, the campus is not a public thoroughfare. Except for the herbaceous garden and a large open meadow, the entire grounds are divided by imaginary lines into sections, each devoted to a single family of woody plants, and arranged in sequence according to the natural system of Bentham and Hooker. Within the limits of the family it is intended to group the trees and shrubs about the buildings chiefly for artistic landscape-effect. Naturally, development in this part of the Garden must be slow. None of the good trees or shrubs originally on the grounds will be disturbed, but all new planting will be made to accord with the new plans. Of trees and shrubs 276 species, in forty-five families, are now growing on the grounds.

In the north-west angle of the campus, and on the lower level, about two and one-half acres have been devoted to the herbaceous garden. It has four parts: (1) the systematic section, (2) the ecological section, (3) the greenhouses, (4) the propagating garden.

A systematic section must always form the centre of any complete botanic garden, for name and relationships are to botanists practically the most important things about a plant. The accompanying plan sufficiently shows the arrangement of this section, which follows the system of Bentham and Hooker, and aims to illustrate the systematically important families and genera, not of New England alone, but of the world. It now contains, along with the ecological section, more than 1,200 species, in seventy-eight families.

For the many plants which will not grow in open beds because they are fitted to a different situation, and that the principles of their adaptation to their particular habitats may be shown, it is necessary to supply those habitats. For this reason we have the ecological divisions. The pond is well stocked with water-plants selected to show the different ways in which plants overcome the drawbacks of that mode of life. A bog is being prepared for bog and marsh forms. The rockery is completed and well stocked with alpine and other rock-dwelling species. Behind the greenhouses a grove of native trees and shrubs has been started in which the shade-loving plants are to be placed. Desert plants will have a place on the sunny bank near the rockery, and strand plants will ultimately be present also. In addition to the ecological groups, there are important principles, needing illustration, of adaptation to particular modes of nutrition, exposure to light, the climbing habit, protection, movements, locomotion (dissemination and pollen-transfer), etc. For these, and for illustrating principles of form and color, a series of beds will be made along the space reserved for the purpose west of the rockery. An economic section has not yet been arranged for, though in a complete botanic garden it should be present. The shrubs which have a place in the herbaceous section are all of special educational interest.

The greenhouses stand in a sheltered corner with a high terraced bank on the north and east. They are a gift to the garden from Mr. E. H. R. Lyman in memory of his mother. They are built and equipped in the most thorough and modern manner. Their divisions are, of course, primarily climatic, but within each there is an attempt at an ecological arrangement. The Warm Temperate House (18 by 42 feet, inside measurement) contains, in addition to plants proper to that climate, a raised tank, eight feet square, in which principal types of water-plants are constantly growing, and a grotto or rock-work, over which water is always trickling, for Liverworts and similar amphibious forms. The Tropical House (18 by 35 feet) contains special collections of Orchids, Begonias and Ferns, with other smaller tropical types. The Palm House (50 by 35 by 25 feet high) is the best furnished and most attractive of the range. Its chief feature is the great central bed in which selected types of larger tropical vegetation—Palms, Bamboos, Figs, Dracænas, Musas, Crotons, Aroids, Ferns—are growing directly in the earth, and form a jungle instructive of many principles of adaptation. The great success of this bed illustrates the value of planting out large plants wherever possible. Other collections in this house are the climbers, Nepenthes, Bromeliads, all chosen for principles which they illustrate. The Acacia and Cactus House (17 by 18½ feet) is filled with forms to show relations to the desert habit. The Cool Temperate House (18½ by 33 feet) contains forms of our own latitudes, and in it large quantities of materials are raised for elementary instruction. In it also is another tank, a group



THE BOTANIC GARDEN OF SMITH COLLEGE
1897

of Sarracenias, and later are to be added halophytes and alpines. The Experiment House (18½ by 33 feet) is chiefly devoted to the practical study of plant physiology by the advanced students. Here a practicum is carried on in which each student works through a series of experiments upon the nutrition, growth, irritability and other vital operations of plants. The laboratory is used by them in this work. A Propagating House (5 by 66 feet) and the workroom, with the boilers beneath, complete the series. This brief sketch does but scant justice to the botanically and educationally interesting contents of the houses. It is difficult to estimate the number of species in them, but it will give some idea to state that they contain 28 species of Palms, 15 of Aroids, 16 of climbers, 15 of economic plants, 56 of Ferns, 8 of Sensitive plants, 78 of Cactaceæ, 37 of Acacias, etc., 20 of Aquatics, 15 of Insectivora, etc. It is not, however, accumulation, but selection, which is the guiding principle here as throughout the Garden.

In practice this arrangement of the houses in parallel series has proved both economical in heat and labor, and convenient for study, and can be strongly commended. There is but one change needed, a larger cool greenhouse, for the present one is too small. In time the Experiment House will be taken for this purpose and a new house and laboratory built on a space reserved along the north of the present range.

The Propagating Garden contains the usual equipment of frames, bulb houses, etc.; in it plants are grown on for winter-flowering, and woody plants for the School of Trees and Shrubs.

A great element in all adaptation is size. This Garden is not for the public, nor even for University work (which Smith College only permits and does not encourage), but is intended for the botanical education of a growing college of about a thousand undergraduate students. This, and economy, have made the Garden the size it is, and it is believed to be ample for a long time to come. The relatively large size of the greenhouses is made necessary by the nature of the American college year, with a winter session and no summer session. Such houses as these, since they allow the study of living plants to be carried on practically regardless of season, both permit the arrangement of the botanical courses upon the best educational principles, unhampered by the usual practical difficulties, and also allow of constant improvement, through experiment, in the providing of the most illustrative materials, in the best condition, for the most thorough, vivid and economical instruction of the different grades of students. It is plain that efficiency in these respects presupposes a gardener of special and unusual qualifications; such is our head-gardener, Mr. E. J. Canning, to whom most of the success of the Garden is due.

Of great importance to any American college contemplating such an equipment is the question of cost, which in this case also has had to be considered with great care. Since the grounds of a college must be kept in good order in any case, and their improvement ought to go steadily on, the additional cost of developing them on a botanical system is not great, and the chief expense is in the care of the herbaceous garden and greenhouses. The winter force in this Garden consists of a head and second gardener, aided by about half of the time of one laborer; the summer force consists of the two gardeners, with from three to four laborers. Materials for stocking garden and greenhouse are, thanks to the generosity of the older gardens of Harvard, Washington and St. Louis, readily obtainable as gifts, or else may be chosen from the exchange seed-lists of the gardens of Europe. Following their example, this Garden issues an annual exchange list, which is sent to all of the great gardens of the world, for which theirs are received in return. During the past year we received from other gardens 744 packets of seeds, all we could use, selected from 23 seed-lists, and in return sent out 1,368 packets selected from our own by thirty gardens, nearly all European. Another question of cost often raised is as to the profit of maintaining a garden when college is not in session at its best time. The answer is, first, if a garden is wanted at all, its maintenance through the summer must be reckoned as a part of its cost, and, second, it is more useful in summer than it seems. The blossom is not always the important part of the plant, nor is the study of flowers all of botany; it is possible within certain limits to select forms which blossom early and late; summer-blooming materials may now be cheaply and well preserved in formaline for winter use; and finally, summer schools may fully utilize the summer condition of a garden.

Although in this sketch the botanical or educational aspect of the Garden has had first place, it is not to be inferred that its æsthetic side is neglected. Plants for beauty as well as plants for use stand in our beds and houses and are open to all. The Garden is yet too new, and in some respects too incomplete to have ripened to full beauty. But in time and with constant growth, it may yet come to pass that there will gather about the gardens of Smith College something of that charm which makes the gardens of Oxford almost sacred ground, where all that is dearest to vigorous and scholarly youth is associated with all that is most beautiful in man's friendship with Nature.

Northampton, Mass. *William F. Ganong.*

Plant Notes.

The Fruit of Sequoia.

IN *The Silva of North America* the fruit of Sequoia is described as maturing during the first season, although both Engelmann, in *The Botany of California*, published in 1880, and Masters, in *The Journal of the Linnæan Society* (xxx., 22), published in 1895, stated that it did not mature until the second season. It is now evident, however, that the statement in *The Silva* was based on the study of insufficient material, and that so far, at least, as Sequoia Wellingtonia is concerned, the fruit does not ripen until the second season. This fact has been pointed out to me by Miss Alice Eastwood, the curator of the herbarium of the Academy of Sciences of California, who has made a careful investigation of the subject, and in a recent letter says: "I think that this is what happens. The trees bloom early, probably in February or March, and the cones grow during the following summer and, perhaps, also during the winter. The next spring they are of mature size and the seeds are ready to germinate. The cones open during the following summer, in August or September, after the hot, dry season." To Miss Eastwood, too, I am indebted for the specimens which show the accuracy of her observations, and which are reproduced in Mr. Faxon's drawing on page 515 of the present issue.

So far as I have seen there is no reason to believe that the second species, the type of the genus, Sequoia sempervirens, does not mature its cones in one season.

C. S. S.

Notes on the Botany of some Southern Swamps.

THE following notes were gathered the past summer during a journey especially devoted to collecting and studying the plants of swampy regions in the states of Missouri, Arkansas, Louisiana, Mississippi, Alabama and Florida.

Leaving St. Louis on the night of July 27th, I arrived at Little Rock, Arkansas, early the next morning, and at sunrise heard the shrill cries of mocking-birds as they left the trees where they had passed the night, announcing, as well as the appearance of Cotton in the fields, the Crape Myrtle and Pride of India trees in the yards, and the Paper Mulberries in the streets, that I was entering the sunny south. The principal indigenous plants observed near the banks of the Arkansas River at this place were the Willow Oak, Spanish Oak, Cow Oak, Catalpa, Sweet Gum, Cassia occidentalis, C. Tora, Jussiæa decurrens, Rhexia Mariana and Hibiscus lasiocarpus. As my object was to study the swamp flora, I did not attempt to make a collection here, but proceeded to Alexandria, Louisiana, noting as good collecting points Varner, Arkansas, and Mer Rouge, Louisiana, for the return trip.

On reaching Pine Bluff, Arkansas, I found that Albizzia Julibrissin was common in cultivation, and that Sabal Adansoni was abundant in low woods along the Arkansas River. Big trees became common from Walnut Lake, Arkansas, southward. Hicoria aquatica, Aralia spinosa, Populus heterophylla and Sesbania macrocarpa are very common beyond Pine Bluff, Arkansas, while the Long Moss (Tillandsia) became conspicuous at Parkdale, Louisiana. Passing through Alexandria and reaching Melville, Louisiana, I found Fraxinus pubescens, var. lanceolata, Brunnichia cirrhosa and Quercus lyrata common in the swamps. Here I paid little attention to the upland flora,

the main object of my journey being to collect swamp specimens and to make special search for Leitneria Floridana, and an Ash-tree which I had found several years ago in the swamps of south-eastern Missouri, and described as Fraxinus America profunda.* Later studies and observations have shown that this tree is abundantly distinct from the White Ash and from all other species of the genus, and I now propose to give to it full specific rank as Fraxinus profunda, under which name it will appear throughout these notes. Believing that these two plants would be found at many stations between Missouri and Florida, I watched for them carefully throughout the trip, with what success the reader will learn later.

Leaving Melville, I went to Bayou Goula, Louisiana, but as the bayou was as dry as the streets of St. Louis I did not stay there long, but went on to White Lake, where there is a large Cypress swamp, which I examined thoroughly, failing, however, to find any Leitneria or Fraxinus profunda, although the Green Ash was present in goodly numbers. Here I first saw the French Mulberry (Callicarpa Americana), with its attractive bright reddish purple fruits; and here also I made the acquaintance of the beautiful Aspidium patens, which covers with tall graceful fronds the higher parts of this swamp.

Leaving White Castle, I went on to Orleans without seeing any suitable place to stop on my return, and then proceeded to Mobile, Alabama, passing several days at Spring Hill, in southern Alabama, collecting with Dr. Mohr, who introduced me to a number of the most interesting southern plants. On the borders of swamps in this region I was surprised to find the Crape Myrtle, the Pride of India, Albizzia Julibrissin and Zizyphus Jujuba thoroughly naturalized. Leaving this most delightful collecting-ground, I passed on to Florida to seek for the two trees on the Chattahoochee River, stopping on my way to examine several swamps along the route without finding anything of importance until I reached the Chattahoochee River, where I gathered specimens of a fine Clematis in fruit, which appears to be undescribed.

Leaving the Chattahoochee River, I went down the Apalachicola, looking with reverence on Tumion taxifolium and Taxus Floridana. Arriving at Apalachicola, I visited, in company with Dr. Chapman, the St. Mark's branch of the Apalachicola, where Dr. F. Roth found early last spring Fraxinus profunda, and when Dr. Chapman showed me what he had called the Red Ash I was pleased to recognize the species I was looking for. The fruit had already fallen, but I took a few leaf specimens that I might record the locality. The trees here were small, being only from twenty to thirty feet in height, with trunks swollen at the base, as I had found them in Missouri. Here I saw magnificent Cabbage Palms at least fifty feet in height, their tall wide-leaning trunks standing out in bold relief against a background of Swamp Hickories, Pecans and other deciduous-leaved trees. Near the margin of the river dwarf Palmettos flourished with great clumps of Rhyncospora corniculata and its variety patula. Associated with the beautiful Mallow, Kosteletzkya Virginica, and the fine leguminous plant, Vigna luteola, a few specimens of Leitneria were also observed; they were, however, quite small with narrow leaves. At Apalachicola I examined the marshes north of the town, finding there another clump of Leitneria, the plants being larger than those which I had seen on the St. Mark's River, and a broad-leaved Willow which appears to be undescribed. I was much elated on finding here some handsome leguminous plants with fine large scarlet flowers, which proved on examination to be Daubentonia longifolia, which has become introduced into waste places and is spreading along roadsides. Returning from Apalachicola I went to the Chattahoochee River and Spring Hill, Alabama, and then homeward by the way of New Orleans and Alexandria without seeing any further signs of Leitneria or Fraxinus profunda near these places.

Going on to Mer Rouge, I found the White Ash common in that locality, this being the first place in which I had noticed it. There was no sign, however, of the Green Ash,

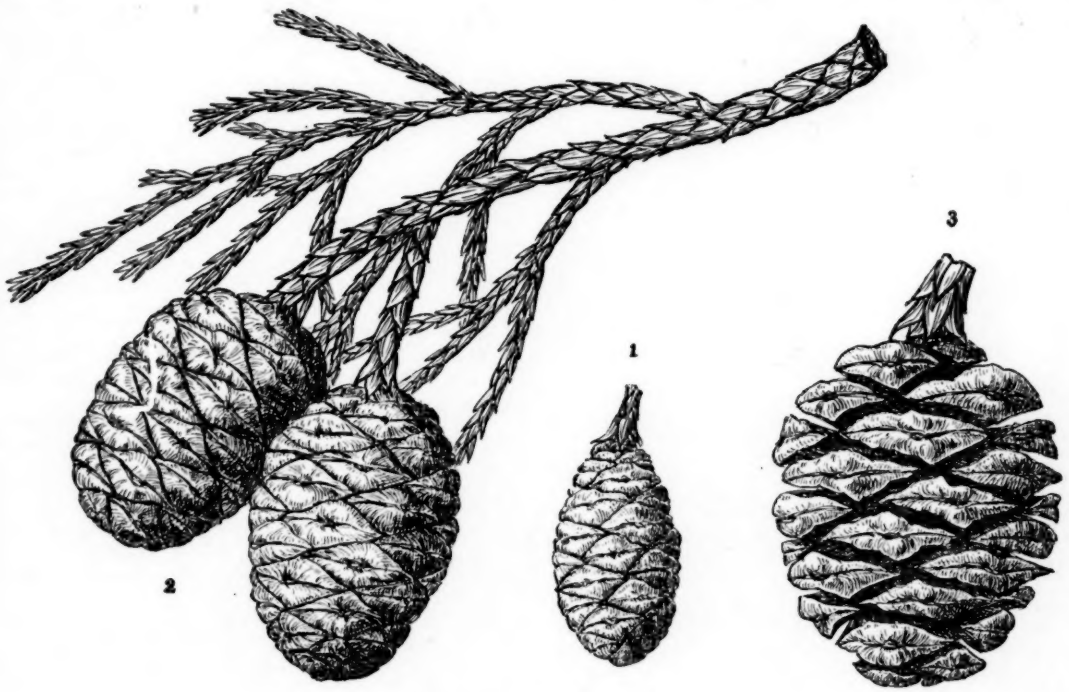


Fig. 66.—Sequoia Wellingtonia.—See page 514.

1. A young cone, gathered in July. 2. A fruiting branch of the same year, gathered in October. 3. A mature open cone of the previous year, gathered in October.

* *Ann. Rep. Missouri Bot. Gard.*, v., 147 (1894).

which is common from south of Mer Rouge to New Orleans. Here I saw also the common Papaw, which I had not observed further south. Leaving Mer Rouge, I went to Varner, Arkansas, where I spent two days in examining the country near the railway station. Here I observed the French Mulberry in abundance, and also the White Ash. The second day I went some distance into the lowlands, across Cypress Creek, and here I found Fraxinus profunda in great quantities, besides plenty of Green and White Ashes. I examined several hundred trees of Fraxinus profunda, but could not find any fruit, although I secured good leaf specimens, as well as those of Leitneria, which is also abundant here. My guide told me that the people in the neighborhood called Fraxinus profunda Pumpkin Ash on account of its being swell-butted, a character which I had already noted in the trees in Missouri. This Ash grows here to a height of one hundred feet, with a trunk eighteen inches in diameter, and is larger and better developed and more abundant than I have seen it elsewhere. The Leitneria was also larger than at Apalachicola, being here about twelve feet in height, with stems nearly four inches in diameter. The Arkansas River is only six miles distant from this point, and although I examined the country carefully the next day I did not see either a Pumpkin Ash or Leitneria on its banks.

Leaving Pine Bluff, I went next to Marked Tree, Arkansas, where I fully expected to find both Fraxinus profunda and Leitneria, as this place is at the junction of the St. Francis and Little Rivers, on which further up in Missouri I had collected the two trees. I was disappointed however, in not finding either of them. Leaving Marked Tree, I went to Papaw Junction, in New Madrid County, Missouri, where I found the Fraxinus profunda in abundance, and where it is almost the only Ash. Here the trees were in splendid fruit. At this point the Green Ash appears to be rare, and, on account of the exceedingly dry season and the draining of the overflow of Little River by a new canal, the fruits of the Pumpkin Ash were remarkably small here, still showing, however, the characteristic form which first attracted my attention.

I saw no Leitneria at Papaw this year, although when I was there two seasons ago I was told that it grew in the neighboring swamp. This is probably true, as the conditions for it are exactly right. The Pumpkin Ash here is a rather medium-sized tree, growing to a height of about fifty feet, with a trunk a foot in diameter. I am of the opinion that the regions of the greatest abundance and largest development of the Ash and the Leitneria are somewhere in the vicinity of Big Lake, that is, in south-eastern Missouri and north-eastern Arkansas.

Courtney, Mo. *B. F. Bush.*

The Forest.

The Shasta Fir (Abies Shastensis).

AMONG the conifers of the Pacific coast, two Firs, Abies nobilis and Abies magnifica, have long been a hard knot for botanists. Abies nobilis was described in 1833, Abies magnifica in 1863, and after various bibliographical vicissitudes, during which the real distinctness of the two was seriously questioned by the highest botanical authorities both in the United States and Great Britain, the essential distinctive character of the species was considered by Dr. Engelmann in 1878* to be the exserted bracts on the cones of A. nobilis, a tree of the Cascade Mountains of Oregon, and the included bracts of A. magnifica, a tree of the Sierra Nevada of California, a position he still maintained in 1880.† Two years later, however, after a trip through Oregon and California with Professor C. S. Sargent, he expressed the opinion that the real differential mark of the two trees was the grooved leaf of A. nobilis and the two-keeled leaf of A. magnifica.‡ Now, on Mount Shasta, which is intermediate in geographical position between the Cascades and the Sierra Nevada, occur large forests of a Fir with two-keeled leaves and exserted bracts. In the light of his earlier opinion Dr. Engelmann considered this tree a form of A. nobilis, but afterward, in the light of his later opinion, a form of A. magnifica.

In 1890 Mr. J. G. Lemmon took the matter up, following Dr. Engelmann's later view that the grooved leaf constituted the real character of A. nobilis, and ventured to describe the Mount Shasta tree as a variety, Shastensis, of Abies magnifica; and in May of the present year he published it as a distinct species, Abies Shastensis.

During the past summer the writer, in company with Mr. Elmer I. Applegate, of Klamath Falls, Oregon, had ample opportunity, on a journey from end to end of the Cascade Mountains of Oregon, to examine both A. nobilis and A. Shastensis. As no botanist has made this trip before, many new facts regarding the geographical distribution of plants were observed, and among other interesting things, the most of which must be deferred for later publication, the rather startling discovery was made that the bracted Fir abundant in the Crater Lake region and for nearly a hundred miles toward the north along the Cascades, is not Abies nobilis, as has heretofore been supposed, but is in reality Abies Shastensis.

We entered the Cascade Mountains from the east at a point about fifteen miles north of the Oregon-California boundary, and turning northward from Buck Lake toward Lake of the Woods, we came upon the Shasta Fir near the summit of the divide between these two lakes at an elevation of a little more than 5,000 feet. On the following day, traveling south-westward from the Lake of the Woods about two miles on the Dead Indian Road we found the tree again, on the summit of a divide of about the same altitude as the other, and probably continuous with it. These two localities, about twelve miles south-east of Mount Pitt, are situated near the point where the great Cascade Range breaks down, being separated from Mount Shasta, sixty miles to the south, by a broad gap through which the Klamath River flows oceanward from the elevated plains of the interior.

From these first localities we observed the tree northward along the Cascades at points of suitable elevation as far as the mountain immediately south of Davis Lake, one of the reservoir sources of the Deschutes River, about latitude forty-three degrees thirty-five minutes. The tree has been reported by Mr. Lemmon as occurring also westward from the Cascade-Shasta gap in various smaller ranges toward the sea, including Mount Eddy, the Trinity Mountains, Scott Mountains and the Siskiyou Mountains, all except the last lying wholly south of the Oregon-California line.

The individual localities at which we saw the tree in addition to the first two already cited, are in detail as follows: Sparingly about the base of Mount Pitt, in the vicinity of Four-mile Lake, and for three or four miles down the stream that forms its outlet; abundant along the upper part of Anna Creek Cañon to Crater Lake and down the Rogue River road on the western slope of the mountains to Whiskey

* Engelmann, *Trans. St. Louis Acad.*, iii., 602 (1878).
† Engelmann in Brewer and Watson, *Bot. Cal.*, ii., 119 (1880).
‡ Engelmann, *Bot. Gazette*, vii., 4 (1882). I find that while Dr. Engelmann was the first, apparently, to bring this leaf distinction prominently before botanists, especially as a key to the difference between true nobilis and the Mount Shasta tree, that this leaf character had been advanced as early as 1875 (*Gardeners' Chronicle*, page 752) by Mr. Syme, the London nurseryman, as a means of distinguishing nobilis from magnifica. In the note, written by Andrew Murray, in which this character is announced there is an evident hesitation to assert its constancy. The note reads, . . . "There are a great many plants in this country (Great Britain) which have always been considered Picea nobilis (now Abies nobilis), which have been bought as P. nobilis, which have been raised from seed sent home to Great Britain as P. nobilis which yet have tetragonal leaves. I anticipate Mr. Syme's answer to this objection, that P. magnifica has been confounded with P. nobilis in its native country (the north-west coast of America), and that these plants with subtetragonal leaves are really P. magnifica raised from seed sent home as P. nobilis by mistake." This suggested solution of the difficulty is undoubtedly correct in the main, but the trees cultivated in Great Britain under the incorrect name Abies nobilis, having tetragonal or two-keeled leaves, may be not magnifica alone, but some of them Shastensis. The original importation of seeds by David Douglas in 1830, was, of course, true nobilis. John Jeffrey's importation, in 1851-53, was a failure, as none of his seeds grew. The seeds sent by William Murray and A. F. Beardsley a few years later reached Great Britain in good condition and were successfully grown, but none of these could have been A. nobilis, for that tree does not grow in the region in which they got their seeds. All the trees grown from this importation must be either magnifica or Shastensis.

Creek; abundant on Huckleberry Mountain; sparingly on a mountain spur between Crater Lake and Diamond Lake; abundant on the slopes of Mount Thielson and Old Bailey; occasionally along the trail from Diamond Lake northward into the headwaters of the Umpqua; abundant on the south slope of the Calapooia Mountains near their junction with the Cascades, and sparingly on their north slope; occasionally on the lower slopes of Diamond Peak, between Summit and Crescent lakes, and on the lower divide between the latter and Odell Lake; and lastly, on the mountain east of Odell Lake and south of Davis Lake. At this point we turned eastward away from the main mountain chain, but the tree doubtless occurs at least a few miles farther north.

In the Cascade Mountains the Shasta Fir belt has an elevation of from 5,000 to 7,000 feet and the tree is usually associated with Tsuga Pattonii, growing chiefly in the lower part of the Pattonii belt, but it often also crosses the Pinus Murrayana belt and sometimes overlaps on its lower side the uppermost edge of the Pinus ponderosa belt.

In its best development, as, for example, on Huckleberry Mountain and near the summit of the Fort Klamath-Rogue River Road, it is a superb tall tree of magnificent proportions, easily the queen of the forest. Its common height is from 150 to 200 feet and its trunk diameter three or four feet. The trunks of two large, but by no means extraordinary trees near the lower camping-ground at Crater Lake measured fifteen feet seven inches and fifteen feet eight inches in circumference about four feet from the ground. The crown of a mature tree is narrowly oblong in outline, usually equaling from one-half to two-thirds the total height of the tree, supported on a straight, only slightly tapering, branchless trunk, from forty to seventy-five feet in height. The bark is of a reddish gray color on the outside, is regularly and rather deeply fissured, and within has the color of Hemlock-bark in alternating layers of dark red and reddish brown. The branchlets are extremely symmetrical in their ultimate ramifications, so that one standing beneath a tree can always distinguish it by this feature alone from A. lasiocarpa, concolor, grandis or amabilis. The large cones, described in detail below, sit erect upon the branches, and are continually suggestive of little owls.

In general appearance trees of Abies nobilis and Abies Shastensis are to me indistinguishable, though a more intimate acquaintance with them might discover some gross differences. The cones of the two trees, though very similar, can always be distinguished by one familiar with both. The cone of A. nobilis is the slenderer of the two, measurements of the specimens of five collectors giving an average length of 133 millimeters, and an average thickness of fifty-seven millimeters, giving a ratio of 2.33—in short, a typical, well-developed cone is noticeably more than twice as long as broad. In A. Shastensis, cones from six different places give an average of 131 millimeters in length by seventy millimeters in breadth, a ratio of 1.87, indicating that they are usually a little less than twice as long as broad. The cone scales of A. Shastensis are usually from thirty to thirty-five millimeters broad and the seeds about thirteen millimeters long, these measurements in those of A. nobilis being about twenty to twenty-five millimeters and ten millimeters, respectively. In external appearance the cones differ also in another way. The exposed portion of the bract is usually longer and more inclined to be obcordate in A. nobilis, and is abruptly reflexed and appressed to the surface of the cone, thus usually completely covering the scales. The awns of the bracts, above the marginal serrations, are commonly five to seven millimeters long. In A. Shastensis the awn is two to three millimeters long, and the shorter exposed part of the bract, seldom retuse at the apex, is rather loosely recurved, so that a considerable portion of the surface of the cone is commonly visible.

Probably the best diagnostic character of the tree, however, is in the leaves. Unfortunately, good series of the lower leaves of the two species are not accessible, but those of the upper branches, broken dead twigs from which can almost always be found underneath the trees, have been examined in quantity. In both species these leaves are thick, stiff, upwardly curved, keeled on the lower surface, and often, especially on cone-bearing branches, sharp-pointed. On the upper surface of the leaves of A. nobilis there is, however, a sharply defined, narrow groove, while in those of A. Shastensis the upper surface is keeled like the lower, the cross-section therefore being rhomboidal like that of a Picea. The groove in the leaf of A. nobilis does not always reach all the way to the apex, and sometimes in the leaves situated along the middle of the upper surface of the twig, and therefore without lateral curvature, it is entirely wanting, but in the outside leaves of the twig it is invariably present.

Abies nobilis is primarily a tree of the Cascade Mountains, the locality best and longest known for it being Mount Hood. It has been known for several years to extend as far north along the Cascades as Mount Ranier, and now it is reported by Mr. A. J. Johnson, of Astoria, Oregon, as occurring on Mount Baker in extreme northern Washington, close to the British boundary. Southward along the Cascades in Oregon we found it as far as Browder Ridge, on the northernmost headwaters of the Mackenzie, an affluent of the Willamette. This is about fifty miles north of the northernmost point at which we found Abies Shastensis. Our route between these two points lay wholly on the eastern slope of the Cascades, but examination of the western slope in this region will undoubtedly show that the range of the two species approaches much more closely, if they do not, indeed, actually meet. Mr. Johnson has also reported it from the coast mountains of south-western Washington.* The tree grows here, I am informed by Mr. B. E. Fernow, at an elevation of usually 1,500 to 3,000 feet, sometimes extending as low as 500 feet, as, for example, on the north slope of the divide between Grays River and Skamokawa River, about four miles from the sea.

By a strange misapplication of names, the history of which I do not know, the name Larch is applied by the lumbermen of Washington and Oregon to both Abies nobilis and Abies Shastensis, but I could find no evidence that the two are distinguished by them. Both are considered valuable for lumber, though from the high elevation at which they grow, and their consequent inaccessibility for the most part, neither has as yet come into the lumber market in large amount.

Though it is several years since I had the opportunity of observing Abies magnifica in the high Sierra Nevada of California, I recall it as a tree of the same magnificent proportions as A. nobilis and A. Shastensis, with the same deep red color of the bark within and the same geometrical regularity of the twigs. From an examination of abundant herbarium material I coincide with the view expressed by Dr. Engelmann and implied by Mr. Lemmon that it is with this tree rather than with A. nobilis that A. Shastensis is the more intimately related. Indeed, in size and relative dimensions of the cone, in the size of the scales and seeds, and in the character of the leaves the two seem to be indistinguishable, the only tangible character being the conspicuous one of protrusion or inclusion of the bracts on the cone-scales. Intergradation is not to be expected between A. Shastensis and A. nobilis, though it may hereafter be found between A. Shastensis and A. magnifica.

Department of Agriculture, Washington, D. C. *C. V. Coville.*

Recent Publications.

Insect-Life: An Introduction to Nature-Study and a Guide for Teachers, Students and Others Interested in Out-of-door Life. By John Henry Comstock. New York: D. Appleton & Co. 1897.

In this admirable text-book the needs of the beginner in

* Abies nobilis was found in August, 1896, in the valley of the Solduc River on the northern slope of the Olympic Mountains in Washington, by Professor Sargent, and was also noticed by Dr. E. Hart Merriam during the past summer in the same locality.

the study of insects have been kept constantly in mind. Although carefully adapted to the teaching of children, the book is intended for adults as well, and it would be hard to find a better introduction to entomology. The treatment of the subject results from the extensive experience of the author in teaching, and commends itself by constantly inducing personal observation, the development of this habit being one of the greatest benefits derived from such study. Part i. outlines a course of study, beginning with a series of carefully graded lessons based on material easily obtained in any part of the country, a locust being selected for the study of the parts of the body. After this knowledge has been acquired the student begins out-of-door study, and is taught about the metamorphoses of insects. The classification of insects and their near relations is then considered, and is treated in a concise and effective way; indeed, it would be hard to find a clearer exposition of the subject. A series of chapters follows on pond-life, brook-life, orchard-life, forest-life and roadside-life, in which typical insects in all the orders are taken up and treated in a simple and clear manner wholly admirable. These chapters are profusely illustrated with wood-cuts of the highest class, the figures (by Mrs. Comstock) being, in fact, one of the notable features of the work. Part ii. treats of the collection and preservation of specimens, and gives complete directions how and when to collect, how to preserve and label, and as to the different methods of breeding insects in confinement. The closing chapter is devoted to a list of some of the most useful books for beginners in entomology.

In every way the book seems to us praiseworthy and a fitting companion to the author's *Manual for the Study of Insects*.

Bird-Life a Guide to the Study of Common Birds. By Frank M. Chapman. New York: Appleton & Co. 1897.

The success achieved by the *Handbook of Birds of Eastern North America* leads one to expect much pleasure from the examination of another book by the same author, and this expectation is fully realized in the case of the volume before us. Beautifully printed, and illustrated by so competent an artist as Mr. E. S. Thompson, it appeals at once to the eye, and the worthiness of this appeal is confirmed by a study of the contents. The care and thought bestowed on its planning and execution have resulted in one of the best text-books ever published on that most fascinating department of Natural History—bird-life. Ornithology in this country has a record of which we may be proud indeed. Raised at once to the highest excellence by the genius of Wilson and Audubon, it has found worthy followers down to the present day, who have maintained the high standard set by them.

The steadily increasing interest in the purely popular side of the subject has been ably met by the publication of such books as the one under consideration. These books deserve the highest praise in giving to the public with absolute accuracy the results of the latest scientific knowledge. To present such knowledge in well-ordered form is a task of no little magnitude, and when, as in this instance, it is conscientiously performed, it deserves our sincere applause. The book is not addressed to professional ornithologists, but to those who desire a general knowledge of bird-life and some acquaintance with our commoner birds. The earlier chapters deal with the place of birds in Nature and their relation to man, and outline the leading facts in their life-histories. The concluding chapters describe 100 or more of the more familiar species of eastern North America and give figures of most of them, many of these ranking among the best bird portraits we have. Such figures as the downy woodpecker, phœbe, field sparrow and veery are exquisite. Throughout the volume there is everywhere evidence of care and judgment, and the reader is impressed on every page by its trustworthiness. In short, the merits of the book are of the highest order.

Notes.

The American Forestry Association will hold a popular meeting at Tampa, Florida, in February. Dr. B. E. Fernow, Chief of the Division of Forestry, will deliver an address on National Forest Reservations and Their Management.

From the recent report of the Parks Committee of the London County Council it appears that 208 open spaces, each less than ten acres in extent, with an aggregate area of 366¼ acres, are now open in London for the enjoyment of the public.

Mr. Horatio N. Rust, of South Pasadena, California, reports an interesting case of the effects of natural root-grafting noticed by him on the Sierra Madre Mountains, where he has found that a stump of a tree of Pseudotsuga macrocarpa a foot in diameter, and cut down about thirty years ago, has continued to live and that a layer of wood and bark has formed over the entire top without the assistance of leaves from the stump itself.

By act of Legislature of the state of New York the College of Agriculture of Cornell University is empowered to conduct University Extension work in agriculture in this state. Scientific knowledge effecting practical agriculture is thus brought into the farmer's home in a popular and reliable form. A class which now numbers several hundreds is engaged in a course of reading in some of the fundamental principles of agriculture. Those wishing to join the class should address Professor I. P. Roberts, at Ithaca, New York. Printed matter for study is sent to applicants free of charge.

A correspondent sends us a beautiful photograph of Rhododendron Catawbiense at Balinie, Scotland, described as being over twenty feet in height with a spread of branches, which rest on the ground, 172 feet in circumference. This remarkable plant is about 100 years old and in still vigorous health, as is shown by the thousands of flower-clusters with which it was covered when the photograph was taken. This must be one of the oldest specimens of Rhododendron Catawbiense in Europe, and it is particularly interesting because it has grown to a size many times larger than this species ever attains on the mountains of Tennessee and Carolina, which are its natural home.

In the Proceedings of the California Academy of Sciences (third series, vol. i., part 2) Miss Alice Eastwood, curator of the herbarium of the Academy, distinguishes and figures under the name of Iris Purdii the beautiful Iris common in the Redwood region of Mendocino County, which has heretofore been confounded with Iris Douglasiana, which it resembles in its narrow red-based lanceolate spreading leaves and cream-colored flowers. From that species, however, it differs in its larger flowers, in its lighter green, less distinctly nerved, stiffer and often glaucous leaves, broader stamens and shorter, broader capsules. This Iris, which we believe has been successfully flowered by Max Leichtlin in his garden at Baden-Baden, is named in honor of our correspondent, Carl Purdy, of Ukiah, who first noticed and called attention to its peculiar characteristics.

With the present issue, which completes the tenth volume, the publication of Garden and Forest ends. For ten years the experiment has been tried of publishing a weekly journal devoted to horticulture and forestry, absolutely free from all trade influences, and as good as it has been possible for us to make it. This experiment, which has cost a large amount of time and money, has shown conclusively that there are not persons enough in the United States interested in the subjects which have been presented in the columns of Garden and Forest to make a journal of its class and character self-supporting. It is useless to expend more time and money on a publication which cannot be made financially successful, and must, therefore, sooner or later cease to exist.

Mr. J. H. Griffith, room 106, Tribune Building, New York, is authorized to receive money due to the Company, and to attend to any other business matters which may arise in winding up its affairs.

Garden and Forest Publishing Co.